

11.0 Hazardous Materials

11.1 Introduction

For mitigation planning, hazardous materials may be defined simply as any materials that may have negative impacts on human health, animal health, or the environment. Hazardous materials vary widely in their toxicity to humans. That is, exposure to hazardous materials may result in injury, illness, or death. The impacts of a hazardous materials exposure may be short-term with negative effects immediately or within a few seconds, minutes or hours, or long-term with negative effects within days, weeks, or in some cases years after exposure.

Hazardous chemicals are widely used in heavy industry, manufacturing, agriculture, mining, the oil and gas industry, high tech industries, forestry, and transportation as well as in medical facilities and commercial, public and residential buildings. There are literally hundreds of thousands of chemicals that may be hazardous to human health, at least to some extent.

A typical single family home may contain dozens of potentially hazardous materials including fuels, paints, solvents, cleaning chemicals, pesticides, herbicides, medicines and others. However, for mitigation planning purposes, the focus of interest is primarily on larger quantities of hazardous materials in industrial use and on hazardous materials being transported, where the potential for accidental spills or releases is high.

The severity of any hazardous material spill or release incident for an affected community depends on several factors, including:

- a) the toxicity of the hazardous material,
- b) the quantity of the hazardous material spilled or released,
- c) the dispersal characteristics of the hazardous material,
- d) the local conditions such as wind direction and topography,
- e) the location of the spill or release in proximity to sensitive environmental areas such as a watershed that provides a community's drinking water, and
- f) the efficacy of response and recovery actions.

11.2 Effects of Hazardous Materials on Humans

The principal modes of human exposure to hazardous materials include:

- a) Inhalation of gaseous or particulate materials via the respiratory (breathing) process,
- b) Ingestion of hazardous materials via contaminated food or water,
- c) Direct contact with skin or eyes.

Flammable materials are substances where fire is the primary threat, although explosions and chemical effects listed below may also occur. Common examples include gasoline, diesel fuel, and propane.

Explosives are materials where explosion is the primary threat, although fires and chemical effects listed below may also occur. Common examples include dynamite and other explosives used in construction or demolition.

Irritants are substances that cause inflammation or chemical burns of the eyes, nose, throat, lungs, skin or other tissues of the body in which they come in contact. Examples of irritants are strong acids such as sulfuric or nitric acid.

Asphyxiants are substances that interfere with breathing. Simple asphyxiants cause injury or death by displacing the oxygen necessary for life. Nitrogen is a good example. Nitrogen is a normally harmless gas that constitutes about 78% of the atmosphere. However, nitrogen releases in a confined space may result in asphyxiation by displacing oxygen. Chemical asphyxiants are substances that prevent the body from using oxygen or otherwise interfere with the breathing process. Common examples are carbon monoxide and cyanides.

Anesthetics and Narcotics are substances which act on the body by depressing the central nervous system. Symptoms include drowsiness, weakness, fatigue, and incoordination, which may lead to unconsciousness, paralysis of the respiratory system and death. Examples include numerous hydrocarbon and organic compounds.

Hazardous materials may also have a wide variety of more specialized impacts on human health. Other types of toxic effects are briefly summarized in Table 11.1.

Table 11.1
Other Types of Hazardous Materials

Type of Hazardous Material	Effects on Humans
Hepatotoxin	Liver damage
Nephrotoxin	Kidney damage
Neurotoxin	Neurological (nerve) damage
Carcinogen	May result in cancer
Mutagen	May produce changes in the genetic material of cells
Teratogen	May have adverse affects on sperm, ova, or fetal tissue
Radioactive materials	May result directly in radiation sickness at high exposure levels or act as carcinogen, mutagen, or teratogen
Infectious substances	Biological materials such as bacteria or viruses that may cause illness or death

Much of the information above was summarized from Chapter Six of the **Handbook of Chemical Hazard Analysis Procedures**¹. The first few chapters of this handbook contain a concise summary of many of the technical aspects of hazardous materials. These chapters may be useful to readers seeking a more technical introduction to the nomenclature and science of hazardous materials.

11.3 Classification System and Emergency Response Protocols

A standardized system is used to classify and identify hazardous materials. The **2000 Emergency Response Guidebook** (A Guidebook for First Responders During the Initial

Phase of a Dangerous Goods/Hazardous Material Incident)² outlines the classification system. The **2000 Emergency Response Guidebook** is an extremely useful reference book that provides standardized first response protocols and detailed reference sheets for the most common classes of hazardous materials.

Hazardous material releases are predominantly accidental results of traffic accidents, equipment failures or human errors. In rare cases, hazardous material releases may result from deliberate actions of sabotage or terrorism.

In Oregon, the Office of State Fire Marshal has defined standard response protocols for hazardous materials incidents in a series of Standard Operating Guidelines³. This series of about a dozen standard operating guidelines covers every main aspect of emergency response and recovery, including decisions to respond, levels of response, general response guidelines, mitigation methods, decontamination procedures, personal protective equipment, and others.

In Oregon, there is a three-level response plan for hazardous material incidents involving first responders and specialized emergency response teams.

First responders are generally local fire service personnel or Hazardous Material (HazMat) Teams that are trained in basic procedures for the initial (first) response to hazardous materials incidents. The responsibilities of first responders including securing the incident scene and making a preliminary assessment of the potential severity of the hazardous material incident and the level of threat, if any, to persons at and outside of the immediate incident area. In Lane County, most fire service personnel are trained to either the "Awareness" Level or "Operations" Level.

HazMat Teams are specialized teams, composed primarily of fire service personnel, with higher-level training and specialized equipment for dealing with hazardous materials. In Oregon, there are fourteen emergency response teams, each with a defined geographic area of primary responsibility. Statewide, these emergency response teams respond to about 350 hazardous material incidents per year, or about one per day, on average (Standard Operating Guidelines, Team Background³). For Lane County, the HazMat Team with primary responsibility is the HM02 Eugene Team. HM02's response boundaries are bordered by Albany/Corvallis to the north, Roseburg to the south, and Redmond to the east. State of Oregon HazMat Team members are trained to the "Technician" Level or higher.

The three-level response plan for hazardous materials incidents is characterized as Level I Response, Level II Response and Level III response. The distinction between Levels I, II, and III depends on:

- a) class of hazardous material
- b) size of container
- c) fire/explosion potential
- d) leak severity and container integrity, and
- e) threat to life safety.

Level I Responses are those incidents readily controlled or stabilized by first responders. The HazMat Team personnel may provide technical assistance

via telephone or on-site assistance, but full response by a HazMat Team is not required.

Level II Responses are those incidents that require response from a HazMat Team for control or stabilization of the spill. The HazMat Team response level may be 2-4 personnel for identification of the material and guidance on appropriate response actions or the response level may be a small team response of 6-8 personnel.

Level III Responses are those incidents that require special resources, including one or more full HazMat Teams and possibly other outside agencies for support.

Further technical details of the Level I, II, and III responses are given in the State of Oregon Standard Operating Guidelines, Levels of Response to Hazardous Materials Incidents, T-003.³ A very useful glossary of technical terms used for hazardous materials incidents is given in the State SOG Glossary of Terms (Standard Operating Guidelines, Glossary of Terms, SOG-T-002.³)

11.4 Statutory and Regulatory Context

The manufacture, storage, use, transportation, and disposal of hazardous materials are subject to a myriad of federal, state, and local regulations. In the context of mitigation planning and emergency response, we focus on reporting requirements for chemicals subject to mandatory risk management planning and extremely hazardous substances subject to additional reporting and planning requirements.

Oregon statutes governing hazardous materials are included in the following sections of the Oregon Revised Statutes:

- ORS Chapter 453, 453.001 to 453.185 and 453.605 to 453.807
- ORS Chapter 465, Hazardous Waste, Haz. Mat. I
- ORS Chapter 466, Hazardous Waste, Haz. Mat. II
- ORS Chapter 475, 475.405 to 475.495, Illegal Drug Clean-up
- ORS Chapter 480, Explosives, flammable materials, pressure vessels.

Section 112(r) of the Clean Air Act Amendments was designed to prevent accidental releases of hazardous substances. The rule establishes a list of chemicals and threshold quantities for which facilities are subject to subsequent accident prevention regulations. The listed substances have the greatest potential to pose the greatest hazard to public health and the environment in the event of an accidental release.

Hazardous materials may be released to the environment either routinely during manufacturing and other ongoing processes or accidentally. Certain types of businesses are required to report such releases annually for a specified list of chemicals. The paragraph below, quoted from the Office of State Fire Marshal, Hazardous Substance Information System (HSIS)⁴, summarizes the intent and content of the regulatory requirements for substances covered under the Toxic Release Inventory regulations.

“The Toxics Release Inventory (TRI) Program was established by section 113 of the Emergency Planning and Community Right to Know Act (EPCRA) of 1986. Under this program certain businesses are required to submit reports each year on the amounts of toxic chemicals their facilities release into the environment, either routinely or as a result of accidents.”

There are additional reporting and planning requirements for materials deemed to be extremely hazardous. The paragraphs below, quoted from the Office of State Fire Marshal, Hazardous Substance Information System (HSIS)⁴, summarize the intent and content of the regulatory requirements for Extremely Hazardous Materials (EHS).

“SARA Title III, section 302 requires owners and operators to notify the State Emergency Response Commission (SERC) regarding the presence of Extremely Hazardous Substances (EHS) at their facilities. Section 303 requires facilities that possess a threshold planning quantity (TPQ) of an EHS to develop a contingency plan in case of an accidental release, and assist emergency planners and emergency response organizations in developing a plan to protect the community from possible injury from a release of dangerous chemicals.”

In addition to the Oregon and Federal requirements, the City of Eugene also has a Toxics Right-to-Know program that was adopted by local voters in November 1996. The intent of this regulation is to make information about use and release of hazardous materials more available to the general public. The Eugene program requires affected businesses to provide materials balance accounting, meaning that inputs and outputs of hazardous substances must be reported and must balance. Annual reports are available at the Eugene Public Library and online at www.ci.eugene.or.us/toxics. These additional reporting requirements apply to stationary facilities which employ the equivalent of ten or more full-time employees, are engaged in manufacturing, and have inputs of hazardous materials totaling 2,640 pounds or more of hazardous substances in a calendar year.

11.5 Fixed Site Hazardous Materials Locations in Lane County

Hazardous materials at fixed sites are generally identified by a NFPA (National Fire Protection Association) placard, commonly referred to as the NFPA hazard diamond. These hazard placards contain standardized information on the fire hazards and health hazards of the hazardous materials. Technical details about these hazard placards are given in the publication NFPA 704: Standard for the Identification of the Fire Hazards of Materials for Emergency Response (1996).

Hazardous Substance Information System (HSIS)

The Hazardous Substance Information System identifies hazardous substances that are used, stored, manufactured and/or disposed of at business sites in Oregon. The Office of State Fire Marshal (OSFM) annually surveys businesses and requires them to provide demographic information and report hazardous substances at or above reportable

quantities. Businesses possessing reportable quantities of hazardous substances are required to report specific information including the chemical name, maximum amount and storage location. These businesses are also required to notify the OSFM within 30 days of any substantive changes that occur at the facility.

For Lane County, the HSIS database has hazardous materials reports for 4474 companies and other entities such as cities and universities that have hazardous materials. Of these report locations, 1773, or about 40%, have reportable quantities of hazardous materials.

.As shown in Table 11.2, Lane County also has 739 sites with Section 112(r) chemicals, 378 sites with Section 313 Toxics Release Inventory chemicals, and 115 sites with Extremely Hazardous Substances. For mitigation planning purposes, Extremely Hazardous Substances are of special concern.

More detailed information about hazardous materials can be found online in the State Fire Marshal's Community Right-to-Know (CR2K) Hazardous Substance Information Program. Members of the public have the responsibility for informing themselves, getting involved with the planning and emergency response exercises and knowing the potential risks. The Office of State Fire Marshal's Hazardous Substance Information database is available online at <http://www.sfm.state.or.us/CR2K/cr2k.htm>.

Environmental Protection Agency Tier II Chemical Inventory Reporting

In order to comply with the EPA Tier II Chemical Inventory reporting requirements, Oregon businesses must submit an Office of State Fire Marshal Hazardous Substance Information Survey.

11.6 Commentary on Inventory of Extremely Hazardous Substances (EHS)

There are a total of 157 sites in Lane County with reportable quantities of extremely hazardous substances (EHS). Of these 157 sites about 80% (130 of 157) are located in Eugene, Springfield and Junction City. The other 20% of sites (27 of 157) are scattered in other cities/towns that have one or more sites with EHS.

The total inventory of 157 sites contains several dozen different Extremely Hazardous Substances, as the most hazardous component in the on-site chemicals. However, 127 of these sites contain four common Extremely Hazardous Substances or strong acids: hydrochloric acid, hydrofluoric acid, nitric acid and sulfuric acid. There are 44 sites that contain the four most common EHS: ammonia, chlorine, chloroform and formaldehyde. Other EHS include a wide variety of chemicals including pesticides, herbicides, and various other toxic organic and inorganic chemicals. Most of these other EHS are present at only 1 or 2 sites in Lane County.

Lane County has started to evaluate EHS facilities in cooperation with the Local Emergency Planning Committee (LEPC). The LEPC has developed a process that evaluates whether existing emergency management plans from the EHS facility, first responders, hospitals, law enforcement, public works and other entities involved in emergency response will provide adequate protection to the surrounding community if a major chemical release occurred at the EHS facility. EHS facilities within the McKenzie River watershed are being

targeted for conducting the LEPC's Community Capability Assessment since the McKenzie River is the sole source of drinking water to over 200,000 people in the Eugene area.

11.7 Hazardous Materials Transport: Truck Shipments, Rail Shipments and Pipelines

11.7.1 Truck Shipments

Hazardous materials may be transported once or many times during their "life cycle" of raw materials, manufacturing, incorporation into other products, wholesale and retail trade, use, waste disposal, and recycling. For Lane County, transportation accidents present the highest risk for hazardous material incidents.

In eastern Lane County during the month of May 1999 one person was killed and another seriously injured following a head on crash between two commercial trucks on Highway 58 about thirteen miles east of Oakridge.

One of the trucks was westbound down the Willamette Pass on Highway 58 near milepost 49 attempting to negotiate a left curve. The truck crossed the centerline and struck an eastbound truck in the eastbound lane. Impact occurred head on and both trucks went over the embankment. The eastbound truck immediately caught fire from a diesel tank rupture which resulted in an area fire that also burned part of the highway surface.

A few months later, another accident occurred in western Lane County. In August of 1999 a fatal traffic crash involving a commercial truck towing two trailers loaded with gasoline was westbound on Highway 126W near milepost 19 (about four miles east of Mapleton) when it collided with an eastbound pickup. Following the collision, the commercial truck and trailers drove off the north side of the highway and down an embankment where they came to rest near Hood Creek.

The rear trailer ruptured resulting in a significant gasoline spill. Investigators initially believed the fuel spill may have entered the creek, but further investigation revealed the fuel was contained in a natural side channel. The tanker trailers had a load capacity of approximately 11,000 gallons but the full extent of the fuel spill was unknown. Access was delayed due to heavy fumes in the air and safety concerns for first responders.

Personnel from the Department of Environmental Quality and Oregon Department of Fish and Wildlife monitored the area for environmental and wildlife concerns. An estimated three-mile isolation area was established around the scene.

The investigation also involved members of the Oregon State Police Florence Patrol Office. Assisting with the incident were Siuslaw Fire Department, Oregon Department of Fish and Wildlife, Oregon Emergency Response, Oregon Emergency Management, Department of Environmental Quality, Lane County Emergency Management, and Lane County District Attorneys Office. ODOT provided traffic control and a detour was established around the scene on Highway 36.

11.7.2 Rail Shipments

There are 7 rail freight carriers operating in Oregon, according to 2004 data from the Oregon Department of Transportation (ODOT) website (www.odot.state.or.us/rail). ODOT has responsibility for state transit safety oversight.

The main railroads serving Lane County are the Union Pacific and Burlington Northern Santa Fe. There have been a couple of HazMat incidents involving railroads in Lane County.

In July of 1996 a vapor was seen coming from a rail tank car containing hydrochloric acid. The train was isolated and the HazMat Team was called in for a response. In September of 2000 HazMat crew members responded to a possible phenol spill from a rail tank car that was filled to capacity of 40,000 pounds. While hooking up the car railroad personnel reported a "sweet chemical smell" and a leak that had formed an icyle.

11.7.3 Pipelines

The Williams natural gas pipeline runs through Eugene, with two compressor stations in the area. The United States Department of Transportation Office of Pipeline Safety regulates interstate pipelines. USDOT imposes a broad range of standards and inspection requirements for pipeline design, material specifications, construction standards, maintenance and testing requirements. For the United States as a whole, a network of about 300,000 miles of natural gas transmission lines serve about 1.5 million miles of distribution system lines which serve about 160 million customers. Overall, the safety record of natural gas transmission pipelines is good with relatively few significant accidents.

Lane County also has a natural gas distribution system within Eugene and Springfield operated by Northwest Natural Gas. The natural gas pipeline systems of local gas utilities, including the systems in Lane County, almost always follow road and street patterns because of established utility rights of way and because of the need to connect with each building served. Thus, for areas served by natural gas, the local street network is essentially identical to the natural gas distribution pipe network.

Overall, the safety record of natural gas distribution pipelines is good with relatively few significant accidents. Natural gas is not toxic (i.e., not poisonous). However, natural gas can be an asphyxiant if it displaces oxygen in an enclosed space. Natural gas burns readily when ignited, but only when gas concentrations are between 4% and 15% in air. In its pure state, natural gas is both colorless and odorless. The strong odor normally associated with natural gas is an odorant deliberately introduced at low concentrations to serve as a warning of the presence of natural gas. The strong odorant is generally added to natural gas at the local distribution level, by local gas utilities, and is readily detectible in concentrations well below the explosive range.

Fires and/or explosions from natural gas leaks in pipelines are rare. In part, the rarity of fires and/or explosions is due to the fact that natural gas is about 1/3rd less dense than ordinary air. Thus, leaking natural gas does not accumulate near the ground or "pond" in low-lying areas (as heavier gases such as liquefied natural gas or gasoline fumes may do). Instead, leaking natural gas rises rapidly and is dissipated by dilution in the atmosphere. The fires and /or explosions that do occur from natural gas leaks are generally in buildings where the confined space allows leaking gas to accumulate until ignited. In 2000, annual

statistics of hazardous materials incidents⁵, prepared by the Office of State Fire Marshal, show only 45 natural gas incidents statewide in Oregon.

Pipeline breaks due to natural causes may occur due to landslides or earthquakes. Earthquake induced pipe breaks for natural gas transmission lines are most likely to occur in areas of soft soils subject to liquefaction and/or lateral spreading which cause significant pipe displacements. The most likely locations for such breaks during an earthquake are on slopes of soft ground near where pipelines cross rivers or streams.

The most common man-made cause of pipeline breaks is pipeline rupture due to pipes breaking when heavy construction equipment is used to excavate for construction projects. Most such breaks occur in local distribution lines. Pipeline breaks can also be caused by deliberate actions of sabotage or terrorism. Although pipelines are not symbolic targets with political, historical, and cultural significance, they are potential targets for terrorist actions. Major pipeline breaks could disrupt gas service over wide areas with resulting significant economic impacts.

Natural gas utilities and local emergency responders are generally well prepared to deal with natural gas breaks, because such incidents occur frequently enough to have well-standardized response procedures. Evacuations for natural gas distribution system pipeline ruptures are generally limited to the immediate area of the break.

The Kinder Morgan petroleum pipeline transports refined petroleum products, including gasoline, diesel fuel and both commercial and military jet fuel. This pipeline runs from Portland to the Eugene terminal, with an intermediate truck-loading terminal near Albany. From the terminals, petroleum products are transported by truck to customers.

Major petroleum transmission lines, such as the Kinder Morgan line in Oregon, are heavily engineered and generally constructed of welded steel pipe that is strong and reasonably flexible. Major failures are rare, but may occur due to natural or man-made causes. Pipeline breaks due to natural causes may occur due to landslides or earthquakes. Earthquake induced pipe breaks for petroleum transmission lines are most likely to occur in areas of soft soils subject to liquefaction and/or lateral spreading which cause significant pipe displacements. The most likely locations for such breaks during an earthquake are on slopes of soft ground near where pipelines cross rivers or streams.

The most common man-made cause of pipeline breaks is pipeline rupture due to pipes breaking when heavy construction equipment is used to excavate for construction projects. For example, in October 1991 a natural gas pipeline located at Fairmont and Birch streets in Eugene had been cut by a concrete cutter. Both Police and Fire service responded to secure the scene and protect company crews while they performed repairs. In May of 1998 construction excavation broke a 4-inch pipeline located at the intersection of Gateway and Harlow roads in Springfield. In January 2001 a 2-inch natural gas distribution line was broken during a sidewalk excavation performed by Public Works crews. This incident resulted in a continuous release for about an hour and the surrounding area was evacuated.

11.8 Vulnerability and Risk Assessments

As reviewed above in Sections 11.5 to 11.7, there are many fixed locations in Lane County with inventories of hazardous materials and a considerable volume of hazardous materials being transported to, from, within, or through Lane County. For both fixed and in transit hazardous materials, there is a wide variety of types and quantities of materials.

Historically, the safety record for hazardous materials has been good, with relatively few, hazmat incidents. Nevertheless, there is a potential for larger hazmat incidents in Lane County. A brief synopsis of the probable impacts of hazmat incidents on Lane County is given below in Table 11.8.

**Table 11.8
Probable Impacts of Hazmat Incidents on Lane County**

Inventory	Probable Impacts
Portion of Lane County affected	Most hazmat incident impacts would be localized near source of spill, but major spills could have extensive evacuation zones and affect a significant portion of a community in Lane County
Buildings	Negligible impact, except for explosion incidents very near buildings
Streets within Lane County	Temporary street closures likely
Roads to/from Lane County	Temporary road closures likely
Electric power	Generally minor impacts, except for explosion incidents very near infrastructure
Other Utilities	Generally minor impacts, except for explosion incidents very near infrastructure or spills which release hazardous materials into rivers or reservoirs providing public water supply
Casualties	Potential for casualties (deaths and injuries), depending on location and identify of hazardous material(s) involved, time of day and effectiveness of evacuations

11.9 Summary and Mitigation Strategies

11.9.1 Planning and Response

Effective mitigation planning and effective emergency response planning can help reduce the number or frequency of hazardous materials incidents and also reduce the severity of incidents that do occur. In combination, these benefits can significantly reduce the negative impacts of hazardous materials incidents on affected communities. The general principles of mitigation planning, emergency response planning (and training) are well standardized and practiced by Lane County and Lane County.

Perhaps the single most critical factor in enhancing both mitigation planning and emergency response planning is **specific inventory awareness** for major hazardous materials sites within each jurisdiction. Specific inventory awareness means detailed knowledge of the types of hazardous materials, quantities of hazardous materials and locations of every location in a jurisdiction with significant quantities of hazardous materials. In this context, what constitutes a significant quantity varies depending on the toxicity of the material, the

dispersal characteristics and the nature and population of nearby areas likely to be affected by hazardous materials incidents.

Lane County Emergency Management has access to the Office of State Fire Marshall's Hazardous Substance Information System (HSIS) database which contains a vast amount of information on the inventories of hazardous materials at fixed locations in Lane County. This detailed inventory information along with data hazardous materials being transported within or through Lane County, provides the basic data for specific inventory awareness. In combination, with the chemical data and emergency response information provided in the **2000 Emergency Response Guide** and in other sources, these are the basic data necessary for effective planning and effective emergency response.

Pro-active response planning is currently underway for the McKenzie River watershed in Lane County due to its importance as a sole source of drinking water to the Eugene area, presence of numerous hydroelectric facilities, and location of abundant critical habitat for endangered species. A threat assessment was completed in November 2002 that compiled facility hazardous material information from a number of databases including the State Fire Marshall's HSIS database. All facility information, spill incident data, vehicle accident data, and other information was entered into a geographic information system (GIS) for analysis and use in response planning.

The purpose of the Threat Assessment was to identify the most probable chemical threats from transport, storage, and use in the McKenzie River watershed. This information allows the emergency response community to prepare for those chemical threats that have a higher probability of occurring. This threat assessment evaluated the main chemicals that are transported, stored, and/or used in the watershed. This evaluation included: 1) truck and helicopter hazardous material transport; 2) vehicle accident and hazardous material spill history; and, 3) chemicals associated with facilities in close proximity to the McKenzie River. Table 11.9 summarizes the most probable chemicals based on abundance, location, and likelihood of being released to the environment.

**Table 11.9
Most Probable Chemical Threats in the McKenzie River Watershed**

Type of Threat	Most Probable Chemicals
Truck Transport	Petroleum Products ¹
	Fertilizers
	Pesticides/Herbicides
Helicopter Transport	Fertilizers
	Pesticides/Herbicides
Accidents/HazMat Spills	Petroleum Products ¹
Fixed Facilities Near River	Petroleum Products ¹
	Fertilizers
	Sodium Hydroxide
	Formaldehyde

¹ – Petroleum products include: diesel, gasoline, motor oil, fuel oil, waste oil, transformer oil, hydraulic oil, and other petroleum distillates.

This information was used to develop pre-determined response strategies based on the most probable threats and location of high priority critical resources in the watershed that need protection (see Section 11.10.2.3).

11.9.2. Physical Safety Measures

The tanks, other storage containers and transfer systems (valves, pipes etc.) for hazardous materials are frequently subject to damage in earthquakes, with a correspondingly high potential for accidental releases. Proper seismic design, bracing and anchoring of storage systems for hazardous materials can greatly reduce the potential of accidental releases during earthquakes. Bracing and anchoring measures for storage containers and transfer systems (e.g., piping) are often relatively inexpensive, with a large improvement in seismic performance. For small quantities of materials stored in bottles or jugs on shelving, bracing shelving and restraining containers so that they do not fall in earthquakes are particularly important.

Over time, the storage containers and other material handling elements for hazardous materials may be changed many times. In some cases, later modifications may not be designed to the same seismic standards as the original installation or later modifications may compromise the seismic stability of the original installation. Therefore, periodic review and inspections of seismic design, bracing and anchoring are highly recommended for all hazardous material facilities.

For facilities located in mapped flood plains or other areas subject to floodwaters there are two important physical safety measures. First, any containers subject to floating should be properly restrained. In many floods, improperly restrained tanks break free and float downstream, with high potential for negative impacts, including fires from tanks containing flammable materials as well as accidental releases of hazardous materials. Second, special precautions should be taken with water-reactive materials. Such materials should never be stored in low-elevation areas subject to flooding or in locations subject to water from storm water drainage or plumbing failures in a facility.

11.9.3 Standard Operating Procedures

Standard operating procedures for storing, transporting, and handling hazardous materials should be strictly enforced at all facilities. Appropriate training for all staff, with review courses and appropriate protective gear are essential for safety. Rigorous inspection and enforcement of hazardous materials regulations (federal, state, and local) are an important part of the overall process of ensuring safety.

11.9.4 Emergency Response Planning

Pre-event mitigation planning was completed for the McKenzie River watershed in 2003 due to the importance of this watershed to Lane County. The Eugene Water & Electric Board (EWEB) in partnership with 27 local, state, and federal agencies developed a GIS-based McKenzie Watershed Emergency Response System (MWERS) to address the most probably chemical threat in the watershed (Section 11.10.1). MWERS contains GIS information on: watershed characteristics; threats; critical resources; spill response

strategies to protect critical resources; response equipment; emergency contact and notification information; and incident communications and was developed to make it easy for first responders to use without being GIS experts.

First responders and others are able to use this GIS application in the field to efficiently and effectively stabilize accidental or intentional chemical releases as soon as possible and avoid the initial confusion associated with spills. MWERS provides several canned functions that can aide the first responder. Other inherent GIS functions can also be used depending on the incident in question, and the specific analysis and information needs. Although the possibilities of how MWERS will be used in a specific incident are numerous and varied, presented below is an example of how the MWERS could be used during a typical response.

- Responder enters the location of the incident via one of several methods and estimates the McKenzie River's flow rate (Figure 14-8).
- MWERS automatically zooms to the incident area, and presents a mostly downstream view (Figure 14-9).

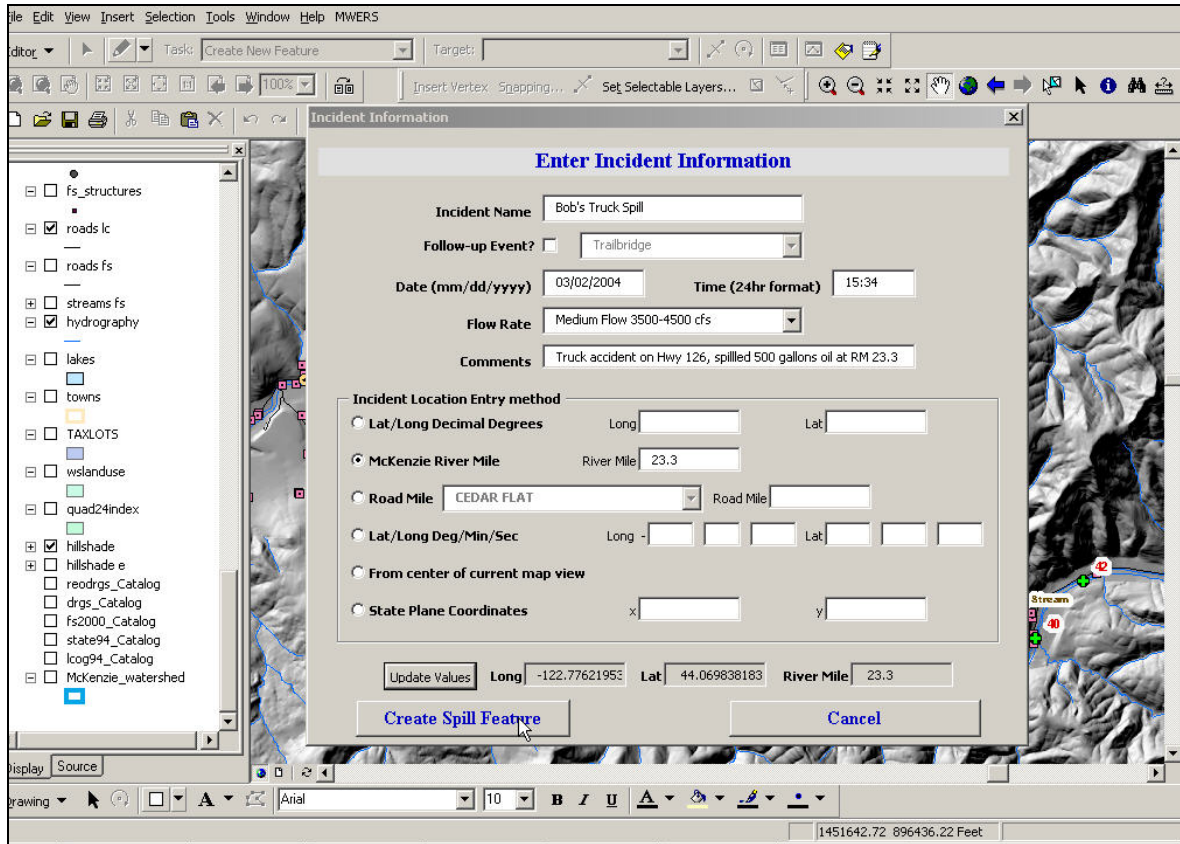


Figure 11.8: Enter Incident Menu Screen

- The responder can visually assess closest downstream response strategies and hyperlink to each response strategy report. Each strategy report provides detailed information and instructions that a responder will use to mitigate a spill (Attachment A).
- The responder can take the list of equipment needed to implement a response strategy and enter the list into the equipment search function (Figure 14-10). This

will provide the responder with the location and contacts for the equipment warehouses that have the equipment necessary to carryout the response strategy.

- The responder can zoom in to the spill area and identify storm drains and/or culverts and obtain specific information about those features that allows him to determine the size and shape of plugs to stop the spilled material from entering storm sewers or crossing under the road into the river (Figure 14-11).

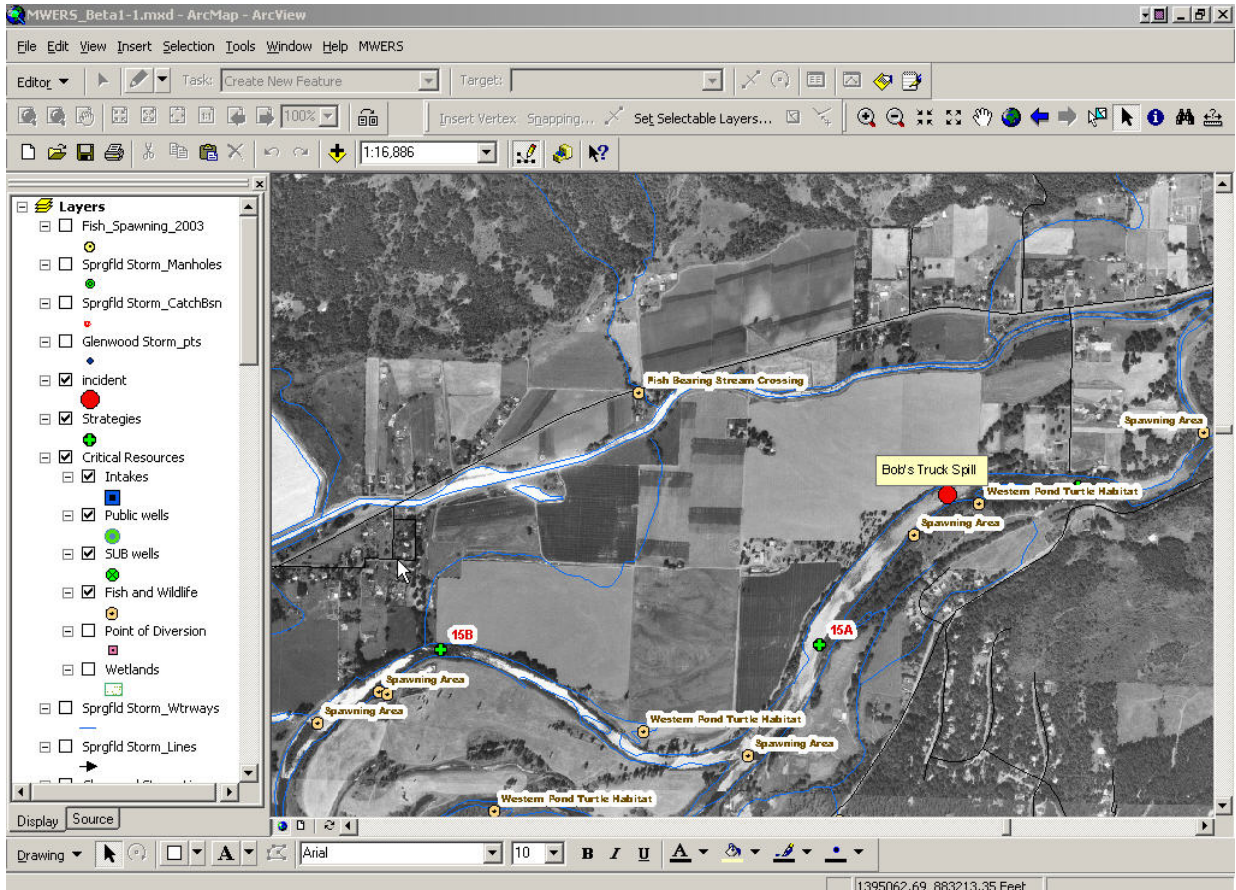


Figure 11.9: Automatic zoom to incident area after entering incident in menu screen.

- The responder can then create a critical resource report that shows each resource, spill travel time, and contact information. The responder can notify the appropriate resource manager(s) for downstream critical resources and provide approximate times until spill reaches that resource (Figure 14-12). Critical resource managers would then be able to start implementing the specific response strategies designed to protect those resources.
- The responder can establish radius distance rings from the incident to calculate population located within that search radius (Figure 14-13). This information is critical to establishing an evacuation plan, estimating shelters and other evacuation supplies, determining where shelter-in-place is appropriate, and provide the geographic area to activate the Community Emergency Notification System (CENS).

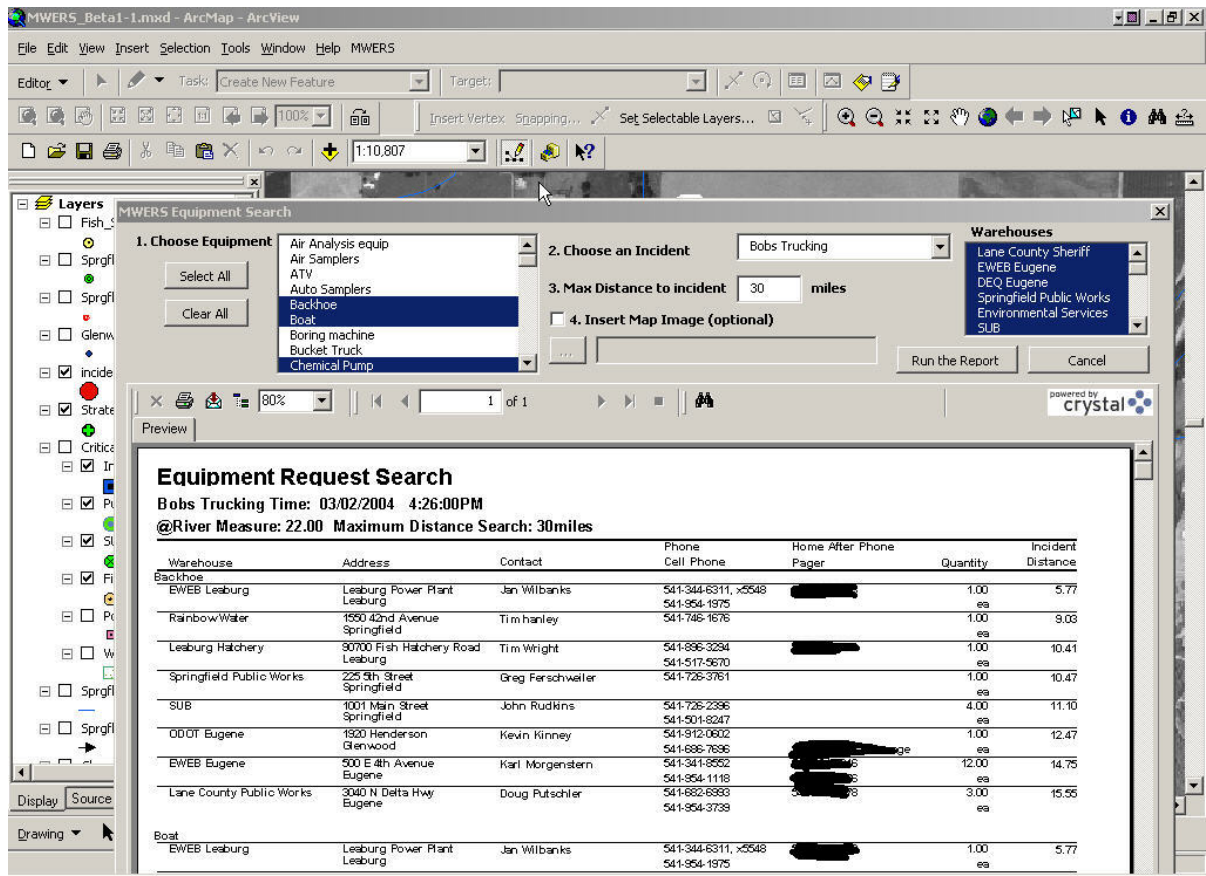


Figure 11.10: Equipment search menu and report sample.

- If the hazardous material is known, the responder can quickly access CAMEO and enter the CAS number or product name and retrieve chemical and physical characteristics for the material in question (i.e., CAMEO is part of the MWERS package).
- If the responder needs more equipment not identified in the strategy report, they can perform a search for the equipment, and retrieve a listing of warehouses and contacts to acquire the additional equipment.
- The responder can save and name the incident location, and enter new spill locations in order to track the progress of the spill over time.

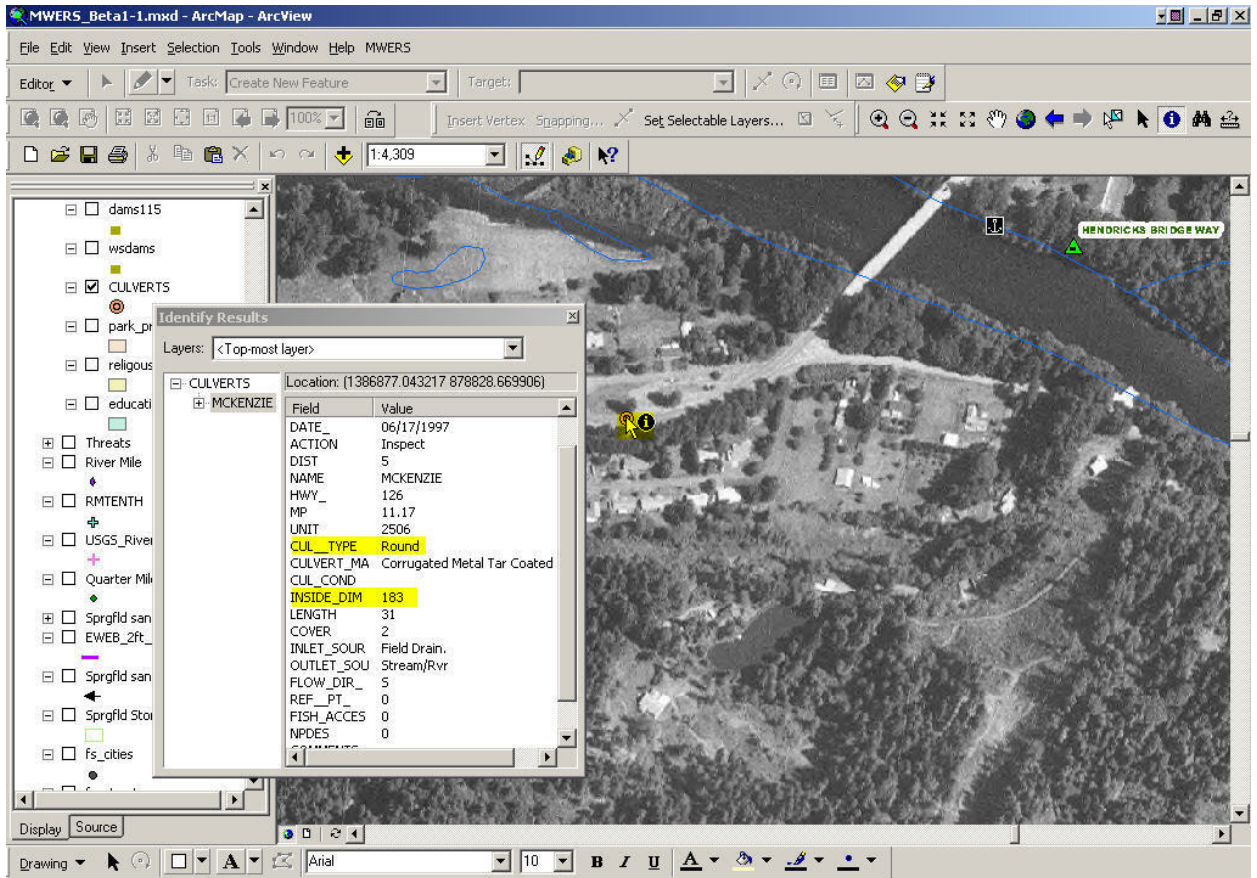


Figure 11.11: Sample of how responder can access highway culvert data to determine plug size.

- If the incident hazardous material is known, but the source is not identified, the responder can search the threats data layers and identify upstream facilities that use or store that hazardous material and use this information to identify the source of the material.
- On larger incidents MWERS can be plugged into the incident command system in the planning section to provide situation maps, aerial photos, and support response planning and design of operations.
- If the responder needs to gain access to property along the river, he can identify the tax lot in question and have access to property owner contact information.

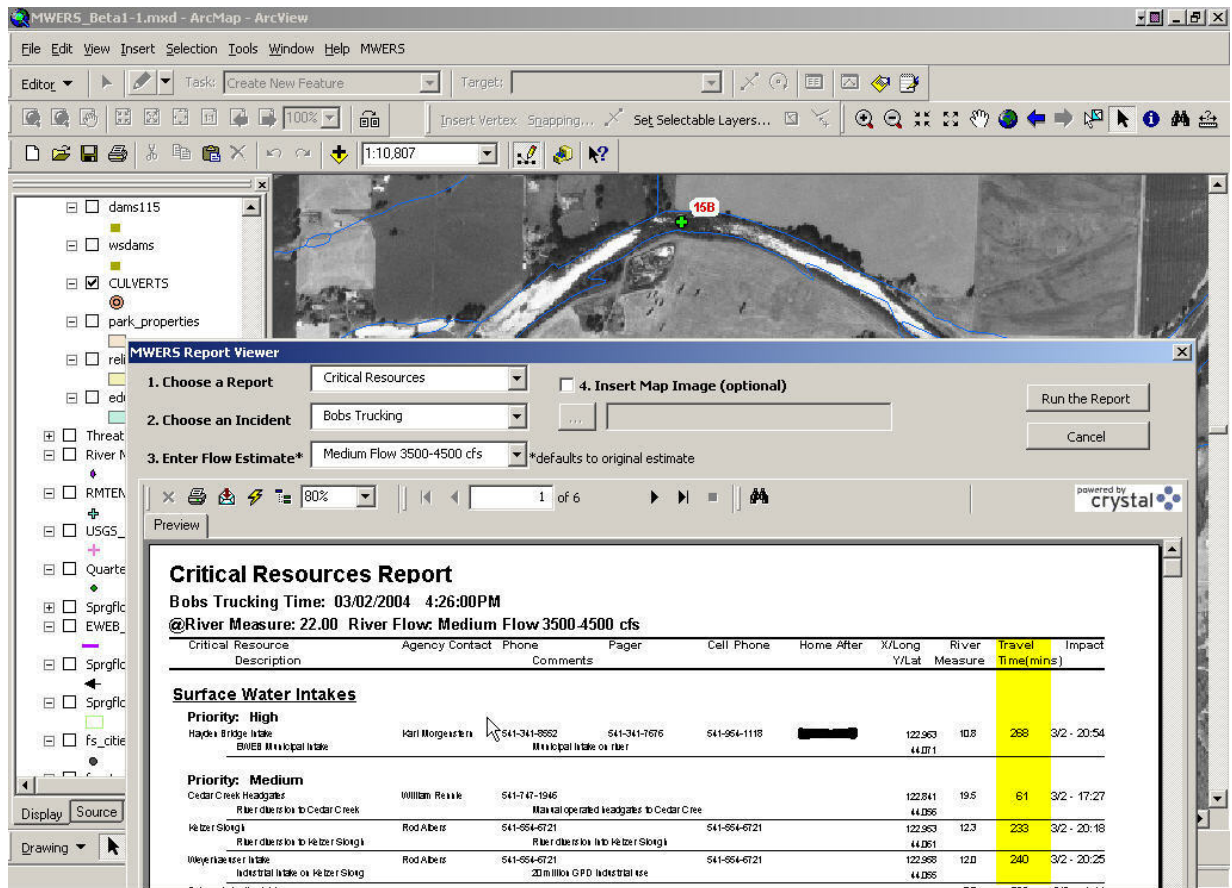


Figure 11.12: Sample report of critical resources downriver of spill (travel time to impact highlighted).

Additional “modules” will be developed that focus on weapons of mass destruction (WMD) incident response, forest fire assessment and response, and natural disaster response. The terrorism incident response Report module is anticipated to be completed by winter 2004 and will include the development of specific response strategies for terrorist activities aimed at high priority targets in the watershed (i.e., chemical facilities, drinking water intakes and treatment plants, hydroelectric plants, dams, sewage treatment plants, and other targets).

The last critical component to watershed emergency planning was raising the level of preparedness among all partner agencies through training and conducting drills together. A wide range of training courses were provided to partner agencies (funded via grants) to raise the level of preparedness. Over 140 people from 23 different agencies completed Incident Command System (ICS), Oil on Water Response Tactics, HazMat Awareness, HazMat Operations, and HazMat Incident Response Tactics training courses in 2003. In addition to increased preparedness and heightened awareness of HazMat issues, these training courses brought together participating agencies and allowed them to understand each other’s roles, gain familiarity, build trust and working relationships, and know what resources/expertise each agency could bring to an incident.

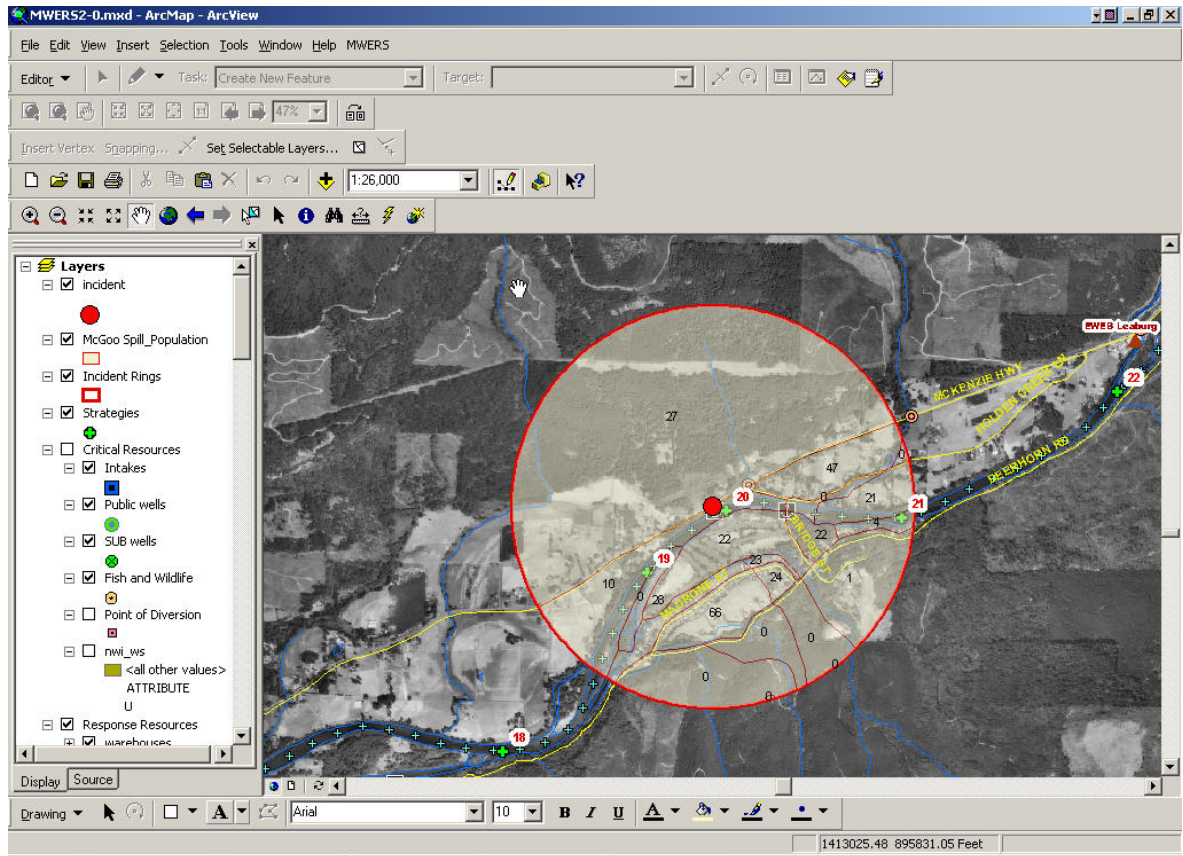


Figure 11.13: Use of radius ring around incident location to estimate population.

**Table 11.14
Hazmat Mitigation Action Items**

Hazard	Action Item	Coordinating Organizations	Timeline	Ideas	Plan Goals Addressed					
					Public Awareness	Life Safety	Protect Property Minimize Losses	Partnerships & Implementation	Emergency Services	Protect Environment
Hazmat Incident Mitigation Action Items										
Short-Term #1	Ensure that first responders have readily available site-specific knowledge of hazardous chemical inventories in Lane County		1 year	pg. 4-4 pp. 14-20 to 14-23		X			X	
Short-Term #2	Enhance emergency planning, emergency response training and equipment to address hazardous materials incidents.		Ongoing	pg. 4-4 pp. 14-20 to 14-23		X			X	

References

1. **Handbook of Chemical Analysis Procedures**, Federal Emergency Management Agency, U.S. Department of Transportation, and U.S. Environmental Protection Agency, U.S. Government Printing Office, 1988.
2. **2000 Emergency Response Guidebook** (A Guidebook for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Material Incident), developed jointly by the U.S. Department of Transportation, Transport Canada, and the Secretariat of Transport and Communications of Mexico, 2000.
3. **Hazardous Materials Emergency Response Teams Standard Operating Guidelines**, May 7, 2001 Office of State Fire Marshal (Oregon). This series of about a dozen standard operating guidelines covers every main aspect of emergency response and recovery, including decisions to respond, levels of response, general response guidelines, mitigation methods, decontamination procedures, personal protective equipment, and others.
4. **Hazardous Substance Information System** (HSIS), Office of State Fire Marshall, Version 1.3P, March 2002. Microsoft Access Database on CD-ROM.
5. **Annual Report of Hazardous Materials Incidents in Oregon** as Reported by Oregon Fire Service, Office of State Fire Marshal (Oregon), 2000 and earlier years.
6. **1998 Milepost Inventory Update Form**, Burlington Northern & Santa Fe Railroad, April 30, 1999.
7. Eugene Water & Electric Board, 2002. *Threat Assessment for Chemical Releases or Spills, McKenzie River Watershed, Oregon*. Prepared by Karl A. Morgenstern.